Notes of some of the Researches in Anatomy, Physiology, Pathology, and Botany, of George Gulliver, F.R.S.*

Appendix and Notes to the English version of Gerber's General and Minute Anatomy, 8vo., with an Atlas of Plates, Lond. 1842.

Introduction and Notes to the Works of William Hewson, for the Sydenham Society, 8vo., Lond. 1846.

Notes to Rudolph Wagner's Physiology, translated by Dr. Willis, 8vo., Lond. 1844.

Lectures on the Blood, Lymph, and Chyle of Vertebrates, delivered at the Royal College of Surgeons, during the Sessions 1861—63; and reported, with engravings, in the Medical Times and Gazette, Aug. 2, 1862, to June 13, 1863.

The Hunterian Oration, delivered at the Royal College of Surgeons, Feb. 14, 1863, and published at the request of the Council of the College.

BLOOD OF VERTEBRATES.

Red Corpuscles.—Extensive Tables of Measurements, and observations on the size, shape, and structure of the red corpuscles (Lond. and Edin. Phil. Mag., Dec., 1839, to Sept. 1842; App. to Gerber's Anat.; Notes to Hewson's Works; Proc. Zool. Soc., at intervals, June 9, 1840, to Feb. 10, and—of the Lampreys—Dec. 6, 1870; College Lectures, Med. Times and Gaz., Aug. 2, 1862, to Dec. 19, 1863; Journ. Anat. and Physiol. vol. 2); with plans to a uniform scale of their size, shape, and structure, in the different classes and orders (Proc. Zool. Soc., Feb. 25, 1862, Feb. 10, 1870, and Coll. Lectures); the Measurements tr. into

* To these notes, which were drawn up long since, but not used, for a particular occasion, a few additions have since been made.

fractions of a millemeter (Milne-Edwards, Leç d'Anat. Comp. et de Physiol., tom. 1, 8vo., Paris, 1856). Several of the results are noted under the ten following paragraph-ciphers :—

1.—The Tragulidæ and some other Ruminants have red corpuscles smaller than any before known (Med. Chir. Tran., Nov. 26, 1839, vol. 23 ; Dublin Med. Press, Nov. 27, 1839 ; Proc. Zool. Soc., Aug. 9, 1842, May 9, 1843, and Feb. 10, 1870).

2.—The Edentates, on the other hand, are characterised by the large size of their red corpuscles (Proc. Zool. Soc., June 11, 1844, Jan. 24, 1854, and Feb. 10, 1870).

3.—That, immediately after Mandl's discovery of the oval shape of the blood-disks of the Dromedary and Paco, these corpuscles are alike oval in every other member of the Camelidæ ; while, moreover, all these corpuscles conform in size and structure to the mammalian or apyrenæmatous type, and by no means to that of the lower or pyrenæmatous classes (Med. Chir. Trans., vol. 23 ; Lond. and Edin. Phil. Mag., Jan. 1840 ; Note to Wagner, p. 237).

4.—Lanceolate, fusiform, crescentic, and other irregular shapes, assumed by the majority of the corpuscles in certain Ruminants (Lond. and Edin. Phil. Mag., with an engraving, Nov., 1840).

5. —The size of the red corpuscles often affords good taxonomic characters (App. to Gerber ; Proc. Zool. Soc., June 9, Nov. 24, 1840, May 25, 1841, Feb. 25, 1862, and Feb. 10, 1870 ; Note xcviii to Hewson).

6.— Though there may be no relation between the size of the corpuscles and that of the species (the Mouse and Horse, *e. g.*) of different orders of the class Mammalia, there is regularly so far such a relation in a single natural order or family of this class, that the smallest corpuscles occur among the small species and the largest corpuscles among the large species of such order or family (App. to Gerber ; Notes xcviii and cxviii* to Hewson's Works ; Proc. Zool. Soc., Feb. 25, 1862, and Feb. 10, 1870).

7.—Relation of the Size of the Corpuscles to Respiration (L. and E. Phil. Mag., Jan. 1840 ; Lecture ix, Med. Times and Gaz., Jan. 17, 1863 ; Proc. Zool. Soc., Feb. 10, 1870 ; Milne-Edwards, Leç sur la Physiol., tom. 1, 8vo. Paris, 1856).

8.—In conformity with the comparative uniformity of the general organization of Birds, there is so little difference in the size of their red corpuscles that the whole class resembles in this respect a single order of Mammalia ; in other words, these corpuscles of Birds are more uniform than the corpuscles of other classes or even of some orders of other Vertebrates. The short diameter of the oval red corpuscles of Birds answering to the diameter of the circular red corpuscles of Mammalia (App. to Gerber ; Note xcviii to Hewson ; Proc. Zool. Soc., Feb. 25, 1862, and Feb. 10, 1870).

9.—While of all oviparous Vertebrates the red corpuscles are nucleated, in all Mammalia these corpuscles are non-nucleated ;

and hence the divisions Pyrenæmata and Apyrenæmata (App. to Gerber; Proc. Zool. Soc., Feb. 25, 1862; Journ. Anat. and Physiol., vol. ii).

10.—*Lepidosiren*.—Observations showing that the red corpuscles of this creature have rather a Bratrachian than Piscine character (Ann. Nat. Hist., Oct. 1848; Proc. Zool. Soc., Feb. 25, 1862, and Feb. 10, 1870).

Pale Globules of the Blood.—The difference between these and lymph-globules, see Lymph, p. 4.

Molecules, as cell-germs, see under Testes, p. 6.

Coagulation.—Proof that the blood coagulates regularly and quickly, and the muscles become rigid, in Deer, Foxes and Hares, hunted to death, and in Birds killed by fighting; contrary to the views, then current, of John Hunter. Experiments showing that increasing the proportion of the red corpuscles hastens coagulation (Edin. Med. and Surg. Journ., Oct. 1845 and 1848; Notes iii and xii to Hewson's Works).

Buffy Coat.—An experimental inquiry, by which was discovered a progressive acceleration of the sinking, from its commencement, of the red corpuscles during the formation of the buffy coat; that this sinking is neither due to an attenuation or a diminished specific gravity of the liquor sanguinis, nor to its retarded coagulation, but (as John Hunter, Wharton Jones and Nasse taught) to an increase of the aggregation into rolls and clumps of the corpuscles, so that when this aggregation is prevented by dilute saline solutions the liquor sanguinis is thinned, its coagulation retarded, and the buffy coat diminished or prevented; while, on the other hand, by artificially increasing the viscidity, or thickness, of the liquor sanguinis, the aggregations of the corpuscles and formation of the buffy coat are hastened or increased. Slow coagulation of buffy blood rather an effect than a cause of the separation of the corpuscles from the liquor sanguinis (Edin. Med. and Surg. Journ., Oct. 1845; Notes, pp. 6 and 34 to Hewson's Work; Lectures, with engraved illustrations, Med. Times and Gaz., Sep. 12 and Oct. 17, 1863).

Fibrin.—Its clot, both in animals and plants, a structure of fibrils, often aggregating into membranous forms, and all this quite independently of cells—contrary to the cell doctrine then universally current—though the fibrinous clots often include cells; and cells, fibrils, molecules, and granular matter, compose the clots or membranes in inflammation. Vital endowments of the blood and fibrin, with comparison of the inspired declaration of the Pentateuch, and the views of Harvey and Hunter (Gerber's Anat., Note, p. 29, and App., plates xxviii and xxix; L. and E. Phil. Mag., Aug. and Sep. 1842; Med. Times and Gaz., Feb. 14 and 28, 1863, figs. 11, 12, 13, 15; Hunterian Oration, 1863).

Softening of Fibrin or Thrombosis.—See page 6.

CHYLE.

Molecular Base.—The milk-like opacity of the chyle had always been attributed exclusively to the chyle-globules, just as the colour of the blood is due to its red corpuscles. But the series of experimental researches, carried on throughout the seasons from 1838-41, resulted in the discovery that this white opacity is due to a ground or base of an infinity of equal-sized particles, so minute that, with any glasses lower than the highest powers then known, this ground presented only a confused opalescent or clouded appearance. But this, by the aid of the deepest objectives and best illumination, was at length resolved into the now well-known molecular base, the chief morphological element of the chyle, since recognised by Professor Hughes Bennett (Lectures on Molecular Physiology, Lancet, 1863) as of much importance in relation to the molecular doctrine of physiology. The formation of this very foundation of the chyle may be greatly quickened or increased by the moderate use of fermented liquor (Med. Times and Gaz., Dec. 12, 1863), a fact at variance with the extreme views of the teetotallers (App, to Gerber, plate xxxii; Note to Wagner, fig. cxlix.; Lectures, Med. Times and Gaz., Nov. 14 and 28, and Dec. 12 and 19, 1863; Hunterian Oration, p 9).

LYMPH.

Researches showing that the majority of the globules of lymph, of chyle, and of the thymus-juice are nuclei, while the well-known pale globules of the blood are nucleated cells; an essential difference not yet recognised, as may be seen, *e. g.*, in the current German books, and in Quain's Anatomy, 8vo., Lond. 1867, p. xlviii (Gerber's Anat., Note, p. 83, App. pp. 89—100, figs. 275—287; Hewson's Works, Note cxxii; Med. Chir. Trans., vol. 23; L. and E. Phil. Mag., June, Aug., and Sep,, 1842; Note to Wagner, fig. cliv; Lectures, Med. Times and Gaz., Oct. 31, Nov. 14 and 28, Dec. 12 and 19, 1863, figs. 17—22, 6 and 5).

THYMUS.

Experimental proofs that it may be emptied of its juice by starvation and filled by nutrition; and (after Hewson) that the thymus is an appendage to the lymphatic system, largest, like the regular lymphatic glands, at the time of life when sanguification and growth are most active (App. to Gerber, plates xxxii—xxxiii.; Introduction and Notes to Hewson; Lectures above cited; and Hunterian Oration, 1863). This view concerning the thymus has since been repeatedly advanced, especially in Germany, as a recent view or discovery; see, *e. g.*, the French translation of Leydig, Traité d'Histologie, 8vo., Paris, 1866.

PULMONARY GLAND OF THE CA'ING WHALE.

A distinct body of the same kind as the thymus (Proc. Zool. Soc., May 24, 1853; and Murie, on Globiocephalus, *ibid.*, 1870.

FISHES.

1.—*Fibres of crystalline Lens.*—Their thinness and smoothness in the Lampreys, and their differences affording taxonomic characters in the class (Monthly Journ. Micros. Sci., April 1, 1869).

2.—*Fovea centralis Retinæ*, in the family of Sparidæ.—(Journ. Anat. and Physiol., Nov. 1867).

3.—*The Lampreys*,—though currently described as 'Dermopteri' devoid of Fin-rays, have these rays. The Genital outlet a single tubular process in each sex. Platyelminthes in the brain (Proc. Zool. Soc., with engravings, Dec. 6, 1870).

4.—*Nondescript Ossicles*, see Bones.

LUNG.

Elastic tissue covering the lung, and an agent in expiration, especially in the Horse (Note, p. 360, to Wagner).

BONES.

1.—*Nondescript Ossicles* in the Skull of osseous Fish (Ann. Nat. Hist., Dec. 1869).

2.—*Reparation of Fractures*, not necessarily a process like that of the original growth, since such flat bones as are developed in membrane may be repaired through a provisional basis of cartilage (Edin. Med. and Surg. Journ., July 1835; Gerber's Anat. Note, p. 177).

3.—*Experiments on Fractures of the Patella.*—These fractures proved to unite by osseous matter, when the fragments are kept in contact by the more or less integrity of their fibrous covering; but when this tissue is completely ruptured, the fractured surfaces cannot be so kept together, and hence unite by ligament only. Thus the then conflicting opinions as to the re-union by bone or by membrane of intracapsular fractures of bones were reconciled (Edin. Med. and Surg. Journ., Jan. 1837).

4.—*Dissection of a Fractured Cervix Femoris* in which there was inversion of the limb (Edin. Med. and Surg. Journ., Oct. 1836).

5.—*Cases of Shortening of the Cervix Femoris*, independently of fractures, in young persons (Edin. Med. and Surg. Journ., July and Oct. 1836).

6.—*Necrosis.*—Experiments showing that the then prevailing doctrine as to the removal of the sequestrum by the absorbents is erroneous. Dead bone ingrafted on living bone (Med. Chir. Trans. vol. xxi, 1838).

MUSCLES OF VERTEBRATES.

1.—*Taxonomic value of the Œsophageal Sheath*, with Tables of Measurements of the primitive fascicles of different muscles (Proc. Zool. Soc., Sep. 10, 1839, June 14, 1842, April 22, 1869, and May 12, 1870).

2.—*Stiffening of Muscles*, and coagulation of blood, in animals killed either by hunting or fighting; contrary to the then current views of John Hunter (Edin. Med. and Surg. Journ., Oct. 1848; Notes iii and xii to Hewson's Works).

TESTES.

Tables of Measurements of the seminal tubes of Mammalia and Aves, with note on the histogenetic importance of minute molecules (Proc. Zool. Soc., July 26, 1842; Hewson's Works, Notes lx and cxliv; Lectures, Med. Times and Gaz., Aug. 23 and Nov. 29, 1862, figs. 7, 11, and 14; Hunterian Oration, p. 9).

FATTY DEGENERATIONS.

Cholesterine, and other fatty matter, forming a diseased state in the coats of the arteries, shown to be the most common cause of spontaneous aneurysm of the large vessels, and of that similar weakening and rupture of the small vessels which is the proximate cause of the most usual form of cerebral apoplexy. Fatty degenerations in organs and morbid products—testicle, Bright's and other diseases of the kidneys, the lungs, tubercle, *e. g.*—in which it had not then been recognised; and such degenerations the immediate cause of the decay or atrophy of several animal tissues and diseased products (Med. Chir. Trans. vol. xxvi, Feb. 28, 1843; Gerber, note, p. 190; Notes to Boyd's Vital Statistics, Edin. Med. and Surg. Journ., 1843, vol. 60; Paget's Lectures on Surg. Path., Lec. vi, 8vo., Lond., 1863; Drs. J. C. B. and Theodore Williams, on pulmonary consumption, Lancet, Apl. 1868).

SOFTENING OF FIBRIN.

Discovery, by an extensive series of experiments and observations, that softening of clots of fibrin is a distinct elementary disease, essentially different from suppuration, though these two diseases had always been confounded. Many years afterwards Prof. Virchow published in Germany the facts as discoveries of his own, under the name of Thrombosis, and that mistake has long been aided and abetted in England (Med. Chir. Trans., 1839, vol. xxii; Gerber's Anat., note, p. 29; Notes to Boyd's Vital Statistics, Edin. Med. and Surg. Journ., 1843, vol. 60; J. Davy, Diseases of the Army, pp. 267 and 288, 8vo., Lond., 1862; Hughes Bennett, Lectures on Molecular Physiol. and Path., Lancet, Apl. 1863;

Aitkin's Science and Practice of Medicine, vol. 2, p. 867, 2nd ed., 8vo., Lond., 1863; T. Wharton Jones, Failure of Sight from railway and other injuries of the spine and head, p. 158, sm. 8vo., Lond., 1869).

TUBERCLE.

1.—*Site of Pulmonary Tubercle*,—shown to be both inside and outside the air-cells (Note to Wagner's Physiol., fig. 175, repeated in Todd's Cyclop. Anat. and Physiol., vol. 3, p. 755; Notes to Boyd's Vital Statistics, Edin. Med. and Surg. Journ., vol. 60, July 1843; L. and E. Phil. Mag., Sep. 1842).

2.—*Histological Characters.*—Young or grey miliary tubercles composed chiefly of cells about 1-2000th inch diameter; crude tubercle, of shrunken, degenerating, shapeless, blighted or withering cells, with a preponderance of granular matter and oily particles, the fatty globules excessive in the brown consolidation of lung in phthisis (Gerber's Anat., App., plates xxix and xxxi; Notes to Boyd's Statistics above cited; Drs. C. J. B. and Theodore Williams, on pulmonary consumption, Lancet, 1868).

3.—*Endowments.*—Not plastic or histogenetic, but, on the contrary, hystolytic, or devoid of inherent power of developement or growth, as the cells from which tubercle originates and increases only retrograde or degenerate into amorphous and lifeless corpuscles, and into granular and molecular fatty matter, all incapable of vitality or organization (App. to Gerber's Anat.; Notes to Boyd's Statistics, and Drs. C. J. B. and Theodore Williams, above cited; Med. Chir. Trans., 1843).

PUS-CORPUSCLES IN THE BLOOD.

These abundant in certain diseases (L. and E. Phil. Mag., Sep. 1838, and 1842, figs. 1 and 2; Gerber's Anat., App., page 20, fig. 269).

PHYTOTOMY.

1.—*Taxonomic value of Pollen.*—Allied species of plants distinguished by their pollen-grains, as exemplified in Ranunculaceæ and Leguminoseæ (Ann. Nat. Hist., July 1865; Seemann's Journal of Botany, with figures, Sep., 1866; Popular Science Review, July, 1868).

2.—*Taxonomic value of Tissue-cells.*—This exemplified in Junceæ and Hymenophylleæ (Ann. Nat. Hist., with engravings, Aug., Oct., and Dec., 1863; Seemann's Journ. Bot., with figures, Oct., 1863, and, with figure of Epidermis of *Lemna trisulca*, Jan. 1869).

3.—*Raphides, Sphæraphides, and Crystal Prisms.*—Their distinctive characters. Extensive researches resulting in the discovery of the importance of raphides as natural characters in systematic botany; that they afford a true distinction which is often more

simple and available, fundamental and universal, than any other single diagnostic; the raphides being constant and most easily found in the plant producing them, from its earliest state—even in the seed-leaves—and throughout its frame in all stages of its existence. Thus, for example, in our Flora, Balsaminaceæ can be at once surely known from the other orders of Thalamifloræ, Onagraceæ from the other orders of Calycifloræ, and Rubiaceæ from the other orders of Corollifloræ; while, on the other hand, an order—Hydrocharidaceæ, *e. g.*—may be as certainly distinguished by the want of raphides which abound in its allied orders (Various numbers of the Ann. Nat. Hist., 1861-65; Seemann's Journ. Bot., March 1864; Quart. Journ. Micros. Science, Jan. 1864, July 1865, and—how and where easiest found—*ibid.* July 1869; as natural characters in the British Flora, *ibid.* Jan, 1866; and in the Flora of the World, with epitome of the author's former observations, Popular Science Review, Oct. 1865; cells and raphides of Duckweeds and exraphidian character of *Wolffia*, with engravings, Seemann's Journ. Bot., Dec. 1866, Jan. 1867 and 1869).

4.—*Latex, Vegetable Fibrin, Starch-sticks, and Molecules,*—described in many British plants (Ann. Nat. Hist., March 1862; Med. Times and G , Nov. 29, 1862, and Feb. 14, 1863, fig. 11).

Fig. 1.

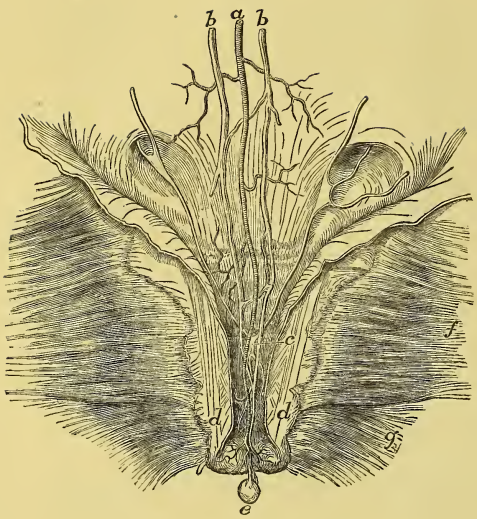

Fig. 2.

Fig. 3.

Fig. 4.